



Rocky Mountain  
Remediation Services, L.L.C.  
... protecting the environment

# PROCEDURE

**CONTAINING, PRESERVING, HANDLING,  
AND SHIPPING SOIL AND WATER SAMPLES**

RMRS/OPS-PRO.069

Revision 0

Date Effective: 05/15/98

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APPROVED: \_\_\_\_\_

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## 1. PURPOSE

This standard operating procedure (SOP) describes procedures that will be used at Rocky Flats Environmental Technology Site (RFETS) for containing, preserving, handling, packaging, and shipping soil and water samples.

## 2. SCOPE

This procedure is to be used as part of the sampling process for Environmental Restoration (ER) activities at RFETS. All personnel performing these procedures are required to have the appropriate health and safety training as specified in the task-specific Health and Safety Plan. In addition, all personnel are required to have a complete understanding of the procedures described within this SOP and receive specific training regarding these procedures.

Only qualified personnel will be allowed to perform these procedures. Required qualifications are based on a minimum of a two year science related degree and/or education, previous experience, on-the-job training, and supervision by an on-site sample coordinator/manager. The subcontractor's project manager will document personnel qualifications related to this procedure in the subcontractor's project QA files.

**This procedure supersedes FO.13.**

## 3. INSTRUCTIONS

Procedures for the containing, preserving, handling and shipping soil and water samples detailed in this SOP follow criteria of the United States Environmental Protection Agency (USEPA). This SOP is intended to present general guidelines for proper sample handling; any deviations or modifications will be documented in the Scope of Work or specific Task Order as well as SOP addendum forms.

DOCUMENT CLASSIFICATION  
REVIEW WAIVER PER  
CLASSIFICATION OFFICE

**ADMIN RECORD**  
SW-A -002667

### 3.1 Equipment List

The following list of equipment is not intended to be task specific. The equipment and materials shown are the minimum that may be needed to ensure that proper procedures are followed for sample handling, packaging, and shipping.

- Sample containers/bottles
- Coolers
- Thermometer
- Blue ice
- Sample labels
- Chain-of-Custody (COC) forms
- Decontamination equipment
- Preservatives
- Plastic bags for containers
- Bubble wrap
- Vermiculite or equivalent
- Strapping and clear tape
- Custody seals
- Garbage bags
- Plastic 5-gallon buckets

Appropriate uses for the equipment are detailed in the following sections of this SOP.

### 3.2 Radiological Release

Prior to field activities, an evaluation of historical data and process knowledge relevant to the sample matrices will be performed by appropriate radiological control personnel. Based on this evaluation, radiological engineering personnel will determine if supplemental radiological screening and/or a Property/Waste Release Evaluation (P/WRE) will be required prior to packaging and shipping samples. Radiological engineering will ensure that contracted laboratories have the appropriate radiological license to receive samples from RFETS. Supplemental radiological screening and/or a P/WRE may be required for the following purposes:

- Establishing that the outside of the sample containers are clean and free from radiological contamination
- Determination of the radionuclide content of the sample (s) to ensure appropriate Department of Transportation (DOT) requirements are met
- Determination of the radionuclide content of the sample(s) to ensure samples do not exceed the limits of the receiving laboratory's radioactive materials license

The P/WRE will include, as applicable, the radiological surveys/analyses and the off-site laboratory information to include: name, contact, phone number, and address. A form will be prepared to document and cross-reference real samples with radiological screening samples, as applicable. A copy of the completed P/WRE will be provided to the project Radiological Control Technician(s) or Health and Safety Specialist(s) responsible for documentation of the radiological surveys, as applicable. A copy of the completed P/WRE will be provided to the project sample coordinator/manager or designee responsible for maintaining project files.

### 3.3 Sample Containers and Preservatives

Only sample containers certified as clean by the manufacturer will be used for sample collection. A file of certificates should be maintained by the project sample coordinator/manager or designee. Newly fabricated containers may be utilized for radionuclide samples, and are not required to be certified. The containers and preservatives may be obtained from the contracted analytical laboratory, their designated supplier, or a suitable chemical supply company. Any preservative(s) required may be added to the container by the contracted analytical laboratory, field sampling team, sample manager, and/or on-site chemist prior to or during sample collection. The chemical preservatives used need to be of reagent/laboratory grade, at a minimum.

The matrices discussed in this SOP for chemical, geotechnical, and radiological parameters are:

Soil Matrix - to include soils, sediments, and sludges

Water Matrix - to include surface water, groundwater, and process liquids

Tables A-1 and A-2 show parameters of interest for water and soil matrices with the recommended associated container size, preservative (chemical and temperature), and holding times. Table A-3 shows geotechnical parameters, containers, preservatives, and holding times for soil and geosynthetic materials.

### 3.4 Container Labeling, Decontamination and Field Packaging

The sample bottles will be labeled by the sample manager or field sampling team. Collection time and date will be completed in the field by the sampler. The labels will indicate, as applicable:

- Location Code
- Activity name and/or number
- Unique sample number (RIN-Event recommended)
- Sample time and date
- Chemical preservative used
- Sample type (grab, composite)
- Analyses required
- Filtered/Unfiltered
- Comments or special precautions
- Samplers initials
- Report Identification Number (RIN)
- Event number
- Bottle number
- Laboratory destination (abbreviations)

The sample label will be marked with a waterproof pen. If needed, clear tape will be placed over labels after sampling to assure that the labels remain legible. If errors are discovered in the COC, the sampler or Sample Manager may correct the mistake by striking through the error with a single line and initialing adjacent to the correction. Write-overs are NOT acceptable.

Subsequent to sampling, the exterior of the sample containers will be cleaned and radiologically surveyed (when appropriate) in accordance the P/WRE, HSP 18.10, Health and Safety Practices Manual, then placed in coolers.

Samples will be placed in coolers with blue ice (if required) and transferred to the laboratory or sample refrigerator as soon as possible to chill the samples to 4°C +/- 2°C. Samples that will be taken directly from the field to the subcontractor for shipping are not required to cool to 4°C +/- 2°C. The field temperatures of the coolers/samples will not be monitored. Samples will not be required to cool down to 4°C in the cooler during the sampling process. Radiological samples do not require refrigeration but must be secured in a cool dry area.

It is recommended that multiple analytes be combined in bottles if volume and preservation requirements are comparable and in accordance with the appropriate analytical method. Check with the Analytical Services Division (ASD) to confirm combinations allowed and volumes required by the laboratory.

### 3.5 Chain of Custody Record

Official custody of samples must be maintained and documented from the time of collection until the time that valid analytical results have been obtained or the laboratory has been authorized to dispose of the sample. The sampling team will be responsible for initiating the original chain of custody (COC) form and will sign and date this form when relinquishing custody of samples. The COC, custody seals, and all sample labels will be reviewed to ensure that all samples are present and in good condition, and that no errors were made in labeling and/or completing the COC. Corrections to the COC may be made by the person in custody of the samples, as described in section 3.4.

A sample is considered to be in a person's custody if any of the following conditions are met:

- The sample is in the person's physical possession
- The sample is in line of sight of the person after he/she has taken possession
- The sample is secured by that person so that any tampering can be detected
- A sample is secured in an area which only authorized personnel can enter by the person in possession

### Tampering of Sample Containers

If, at any time after the samples have been secured, custody seals are identified as having been tampered with, this procedure will be followed to ensure that sample integrity has not been compromised.

- Check cooler temperature to verify 4°C (if applicable)
- Check with all personnel having access to sample coolers to verify possible inadvertent tampering
- Check every sample container for any signs of tampering, such as loose lids, foreign objects in containers, broken or leaking containers, etc.
- Check to ensure adequate and appropriate packaging
- Document all findings of the incident in the sample manager's field log book

If it is determined that malicious tampering of samples has occurred and/or it is believed that sample integrity has been compromised the subcontractor will immediately contact the RFETS project manager.

If it can be determined that sample integrity has not been compromised based on the above criteria, document findings in sample manager's field logbook and proceed with this standard operating procedure.

### Chain of Custody Form

A one page COC form is used by Environmental Restoration. The original copy will be enclosed in a plastic bag and taped inside the lid of the cooler and shipped with the samples. A photocopy of the original will remain on file with the subcontractor's on-site facility. The contract laboratory will sign the COC upon receipt of samples and return a photocopy of the COC to RFETS for input into the electronic database. The COC copy will then be matched and filed to complete the chain of custody procedure. Photocopies of the original COC form will be made, prior to sample shipment, for internal use.

The chain of custody form will include the following:

- Report Identification Number (RIN)
- Event and bottle numbers
- Unique sample number and sample location
- Project number
- Date and time of sample collection
- Name of collector or field custodian
- Laboratory designation
- Sample matrix
- Preservation
- Condition of sample on receipt at the laboratory
- Chain of custody number (optional)
- Signature and date blocks for personnel relinquishing or receiving sample custody
- Space for additional comments
- Name and phone number of emergency contact person
- Analysis requested with Analytical Projects Office line item code
- Required turn around time (priority code)
- Delivery information (overnight, 2-day, airbill #, etc.)

### 3.6 Field Data Documentation

All field descriptions, measurements, and observations will be recorded on the appropriate field data forms (see specific sampling SOPs, task specific sampling analysis plans, and the Field Data Management SOP). The original data forms will be collected, data entered into the database, then filed on-site by the designated subcontractor's data entry personnel. The field data will be entered into the Soil Water Database Field Cap log sheet form. Data may also be recorded in field logbooks if desired. Field data will be filled out at the time a sample is taken and will include, but not be limited to the following information:

- Sampling activity name and number
- Sampling point name and number
- Sample number (RIN-Event recommended)
- Name(s) of Collector(s) and others present
- Date and time of sample collection
- Sample container tag/label number (if appropriate)
- Filtered/unfiltered (if applicable)
- Designation of QC samples (DUP, MS, MSD, Trip Blank, etc.)
- Field observations and measurements during sampling (if applicable)
- Analysis requested

For composite samples collected over time, the time and date of the FINAL aliquot shall be recorded as the sample date and time for the RFETS database. The sample log form or field log book shall include the time and dates for the start and end times of the composite period.

### 3.7 Packaging and Shipping

Sample bottles may be packaged in the field or in the subcontractor trailer. The sampler/packer shall use best judgment when packaging samples. Delivery of samples to the on-site or local lab (Denver metro area) will not require the stringent packing requirements applicable to off-site shipments, if delivery can be accomplished without significant risk to sample integrity. Samples delivered to an on-site laboratory may only require custody seals on bottles and placement in a cooler with blue ice (if required) if container integrity can be assured during transport. Samples delivered to Denver metro area labs by RFETS personnel are not required to use vermiculite or packaging labels (i.e., "fragile" and "up") if the container integrity can be assured during delivery. All samples delivered by third party carriers (e.g., Federal Express) are required to follow the complete packaging requirements established below.

All sample containers shall be decontaminated prior to shipping. Upon receipt and verification of sample containers and COC forms, the following steps will be taken:

1. Notify the designated laboratory prior to shipment if samples collected in the field are suspected of containing any other substance for which the laboratory personnel should take additional safety precautions.
2. Verify that all samples requiring radiological screening have the associated on-site laboratory radiological analysis verification or documentation.
3. Subcontractors are responsible for radiologically clearing all containers prior to shipment offsite in accordance with the appropriate P/WRE.
4. Line the sample cooler with a large plastic bag.
5. Place approximately 3 inches of vermiculite in the bottom of the cooler.
6. Wrap glass containers in bubble wrap.
7. Place individual containers in ziploc bags (large bottles may be contained in a tied bag).
8. Place wrapped sample containers upright, except for the volatile organic compounds (VOC) vials in the cooler with approximately 1 inch between them and the sides of the cooler.
9. Fill the cooler approximately three-quarters full of vermiculite, making sure that sample containers are securely packed.
10. Insert the VOC vials inverted in the center of the cooler.
11. Fill the cooler with vermiculite, allowing adequate space at the top for blue ice.
12. Bag the blue ice (or equivalent) and place several packages in the top space of the cooler.
13. Seal the signed COCs and a copy of the RAD screen results (as necessary) in a plastic bag and tape it to the underside of the lid of the cooler.
14. Place signed and dated custody seals in two locations sealing the cooler lid so that tampering will be evident.
15. Tape the drain of the cooler shut.
16. Wrap strapping tape around the cooler in two locations to secure the lid.
17. Place the airbill on top of the cooler. If more than one cooler is sent to the same laboratory, an address label and a manifest label are needed.
18. Place "This side Up" and "Fragile" labels on the top and two sides of the cooler.
19. Place "↑" labels on all four sides of the cooler.
20. Place "Environmental Samples" labels on top of the cooler.
21. For coolers weighing over 75 pounds, an additional "Heavy Weight" label is required in the two opposite corners on the top of the cooler.

Sample coolers may be received by courier at a predetermined area at RFETS. If arrangements cannot be made, a company vehicle is required to deliver sample coolers to the laboratory and/or courier office.



### 3.8 Quality Assurance / Quality Control Samples

Quality Assurance (QA) and Quality Control (QC) will be administered according to the Quality Assurance Project Plan (QAPP), the project specific Quality Assurance Addendum (QAA), the RMRS Quality Assurance Program Description (QAPD), and QC requirements presented in the SOP.

### 4.0 Records

Documentation of observations and data acquired in the field will create a permanent record as well as provide information on the handling and preparation of the samples collected. Sampling personnel will be responsible for documenting the handling preparation, packaging, and shipping of the samples. These observations and data will be recorded in ink on the subject specific data sheets (i.e. instrument calibration data sheet, field measurement data sheet and field log books).

Copies of the chain of custody records for the samples shipped during the data collection task will be kept on file at the site office and the subcontractor's main office (if appropriate).

The following records generated during the performance of this procedure must be controlled as follows:

<u>Document</u>	<u>Record Type</u>	<u>Disposition</u>
Original COC form	QA	Becomes part of the ASD project file
P/WRE	QA	Becomes part of the project file
Sample log sheets or logbook	QA	Becomes part of the project file

### 5.0 References

#### Source References

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*American Society for Testing and Materials (ASTM), Soil and Rock; Dimension Stone; Geosynthetics, Section 4, Volume 04.08, 1993.*

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Interim Final. October 1988.

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*Technical Enforcement Guidance Documentation (TEGD)* USEPS. 1986

*Test Methods for Evaluating Solid Waste, Volume II: Field Manual Physical/Chemical Methods.*  
USEPA. SW-846. 3<sup>rd</sup> Edition. November 1986.

*User's Guide to the Contract Laboratory Program.* USEPA. December 1988.

TABLE A-1  
SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES

WATER MATRIX

Parameter	Sample Volume/Container <sup>a,c</sup>	Preservative	Holding Time
<b><u>Volatile Organics (VOCs)</u></b>			
Contract Laboratory Program (CLP)	2 x 40-mL VOA vials with Teflon lined septum lids	Cool, 4°C	10 days
40 CFR Part 136	2 x 40-mL VOA vials with Teflon lined septum lids	Cool, 4°C <sup>b</sup>	7 days
40 CFR Part 136	2 x 40-mL VOA vials with Teflon lined septum lids	Cool, 4°C HCl pH <2 <sup>b</sup>	14 days
SW-846	2 or 3 x 40-mL VOA vials with Teflon lined septum lids	Cool, 4°C HCl pH <2 <sup>b</sup>	14 days
Drinking Water (500 Series Methods)	3 x 40-mL VOA vials with Teflon lined septum lids	Cool, 4°C HCl pH <2 <sup>a</sup>	14 days
Extractable Organics (BNAs)	3 x 1L amber G	Cool, 4°C <sup>b</sup>	7 days until extraction, 40 days after extraction
Pesticides and PCBs	2 x 1L amber G	Cool, 4°C <sup>b</sup>	7 days until extraction, 40 days after extraction
Organophosphorus Pesticides and Herbicides	2 x 1L amber G	Cool, 4°C	7 days until extraction, 40 days after extraction
Dioxins/Furans	2 x 1-L amber G	Cool, 4°C	7 days until extraction, 40 days after extraction
Metals	1 x 1-L P	Nitric acid pH <2	6 mo <sup>c</sup>
Cyanide	1 x 1-L P	Sodium hydroxide <sup>d</sup> pH>12; Cool, 4°C	14 days
Sulfide	1 x 500 ml P	2 ml-zinc acetate and sodium hydroxide to pH>9; Cool, 4°C	7 days
Acidity	200 ml/P, G	Cool, 4° C	14 days
Alkalinity	200 ml/P, G	Cool, 4° C	14 days

**TABLE A-1 (continued)**  
**SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES****WATER MATRIX**

Parameter	Sample Volume/Container <sup>a,c</sup>	Preservative	Holding Time
Bacteriological (Coliform)	1 L/P, G (Sterile)	Cool, 4° C <sup>b</sup>	6 hr
Whole Effluent Toxicity (Acute, Chronic)	16 L/P	Cool, 4° C	48 hr
Biochemical Oxygen Demand 5 Day (BOD5)	2 L/P, G	Cool, 4° C	48 hr
Carbonaceous Biochemical Oxygen Demand 5 Day (CBOD5)	2L/P, G	Cool, 4° C	48 hr
Chemical Oxygen Demand (COD)	300 ml/P, G	Cool, 4° C, Sulfuric Acid to pH<2	28 days
Ammonia	400 ml/P, G	Cool, 4° C, Sulfuric Acid to pH<2	28 days
Chloride	200 ml/P, G	None	28 days
Chlorine Residual	In situ, beaker or bucket	None	Analyze immediately
Color	200 ml	Cool, 4° C	48 hr
Conductivity	300 ml/P, G	Cool, 4° C	24 hr (determine on-site if possible)
Chromium, Hexavalent	200 ml/P, G	Cool, 4° C	24 hr
Dissolved Oxygen (DO) (Probe)	In situ, beaker or bucket	None	Determine on-site
Dissolved Oxygen (DO) (Winkler)	300 ml glass, BOD bottle	Fix on site, store in dark	8 hr (determine on-site if possible)
Solids, Settleable	2 L/P, G	Cool, 4° C	48 hr
Solids (Total and Suspended, etc.)	200 ml/P, G	Cool, 4° C	7 days
Sulfates	500 ml/P, G	Cool, 4° C	28 days
Temperature	In situ, beaker or bucket	None	Analyze immediately

TABLE A-1 (continued)  
SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES

## WATER MATRIX

Parameter	Sample Volume/Container <sup>a,c</sup>	Preservative	Holding Time
Turbidity	200 ml/P, G	Cool, 4° C	48 hr
Nitrate as N	250 ml/P, G	Cool, 4° C	48 hr
Nitrite as N	250 ml/P, G	Cool, 4° C	48 hr
Nitrate + Nitrite as N	250 ml/P, G	Cool, 4° C, Sulfuric Acid to pH<2	28 days
Fluoride	100 ml	Cool, 4° C	28 days
Hardness	300 ml/P, G	Nitric Acid, pH<2	28 days
Total Organic Carbon (TOC)	50 ml/P, G	Cool, 4° C, Sulfuric Acid to pH<2	28 days
Nutrients <sup>f</sup>	1-L/P, G	Sulfuric Acid pH<2 , Cool, 4° C	28 days
Oil and Grease	1-L G with Teflon liner	Sulfuric Acid pH<2 , Cool, 4° C	28 days
Organic Halides - Total (TOX)	1-L G with Teflon liner	Sulfuric Acid pH<2 , Cool, 4° C	28 days
pH	In situ, beaker or bucket	None	Analyze immediately (24 hr)
Phenols	250 ml G with Teflon liner	Sulfuric Acid pH<2 , Cool, 4° C	28 days
Phosphate-Ortho	500 ml/P, G	Cool, 4° C	48 hr
Phosphorous, Total or Dissolved	500 ml/P, G	Sulfuric Acid pH<2 , Cool, 4° C	28 days
Radiological Tests <sup>h</sup>	3 x 4 L plastic containers <sup>i</sup>	Nitric Acid, pH<2	6 mo.
Tritium	125 ml G	None	None

TABLE A-1 (continued)  
SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES

WATER MATRIX

Parameter	Sample Volume/Container <sup>a,c</sup>	Preservative	Holding Time
<b><u>Toxicity Characteristic</u></b>			
<b><u>Leaching Procedure</u></b>			
<b><u>(TCLP)</u></b>	4 L amber glass <sup>f</sup>	Cool, 4° C	
TCLP Volatiles			Extract within 14 days, analyze within 14 days
TCLP Semivolatiles Pesticides, and Herbicides			Extract within 14 days, prep within 7 days, analyze within 40 days
TCLP Metals			Extract within 180 days, analyze within 180 days <sup>g</sup>

- <sup>a</sup> When nonspecific container type is listed (e.g., 8-oz. wide-mouth glass jar), select a container appropriate to the volume and container requirement given. Samples for more than one parameter can be collected into a single container if container and preservation requirements are the same (e.g., sulfate and turbidity).
- <sup>b</sup> Add 0.008% sodium thiosulfate (Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>) in the presence of residual chlorine.
- <sup>c</sup> Holding time for mercury is 28 days.
- <sup>d</sup> Use ascorbic acid only if the sample contains residual chlorine greater than 0.2 mg/l. Test a drop of sample with potassium iodine-starch test paper; a blue color indicates need for treatment. Add ascorbic acid, a few crystals at a time, until a drop of sample produces no color on the indicator paper. Then add an additional 0.6 g of ascorbic acid for each L of sample volume.
- <sup>e</sup> P = Plastic (polyethylene); G = Glass; BOD = Biological Oxygen Demand; ASAP = As Soon As Possible; NS = Not Specified
- <sup>f</sup> Nutrients include nitrogen, phosphorus, chemical oxygen demand.
- <sup>g</sup> TCLP Mercury maximum holding time is 28 days for extraction and 28 days for analysis.
- <sup>h</sup> For Radiological Testing, the specific analyses will be defined as some or all of the following: Gross Alpha, Gross Beta, Uranium 233+234, 235 and 238, Americium 241, Plutonium 239+240, Tritium, Strontium 90, 89, Cesium 137, Radium 226, 228.
- <sup>i</sup> Full suite, see footnote <sup>h</sup> above.
- <sup>q</sup> If samples contain residual chlorine, and measurements of the concentrations of disinfection by-products (trihalomethanes, etc.) at the time of the sample collection are desired, add about 25 mg of ascorbic acid to the sample bottle before filling.
- <sup>r</sup> Volume required for any or all TCLP analyses.

**NOTE:** The specified volumes and containers are recommendations and any changes should be approved through ASD. Multiple analytes should be combined in bottles if volume and preservative are comparable and follow the appropriate analytical method. Check with the ASD to confirm combinations allowed and volumes required by the laboratory.

**TABLE A-2**  
**SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES**

**SOIL MATRIX**

Parameter	Sample Volume/Container <sup>a</sup>	Preservative	Holding Time
Purgeable Organics (VOCs)	120-mL capped core, 4 or 8 oz. Wide mouth glass jar Teflon-lined closure	Cool, 4°C	14 days
Extractable Organics (BNAs), Pesticides and PCBs	1 x 8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	14 days until extraction, 40 days after extraction
Organophosphorus Pesticides and Herbicides	1 x 8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	14 days until extraction, 40 days after extraction
Dioxins/Furans	1 x 8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	14 days until extraction, 40 days after extraction
Metals	1 x 8-oz. Wide-mouth glass jar	Cool, 4°C	6 mo <sup>c</sup>
Cyanide	1 x 8-oz. Wide-mouth glass jar	Cool, 4°C	14 days
Sulfide	1 x 8-oz. Wide-mouth glass jar	Cool, 4°C	7 days
TCLP Volatiles	8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	Extract within 14 days, analyze within 14 days
TCLP Semivolatiles Pesticides, Herbicides	8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	Extract within 14 days, prep within 7 days, analyze within 40 days
Reactivity (CN <sup>-</sup> , H <sub>2</sub> S) pH, EOX	8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	7-14 days
TCLP Metals	8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	Extract within 180 days, analyze within 180 days <sup>d</sup>
Nutrients <sup>f</sup>	8-oz. Wide-mouth glass jar, Teflon lined closure	Cool, 4°C	28 days
Radiological Tests <sup>h</sup> and Tritium	500 ml wide mouth glass <sup>i</sup>	None	None

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TABLE A-2 (continued)  
SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES

SOIL MATRIX

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- <sup>a</sup> When nonspecific container type is listed (e.g., 8-oz. Wide-mouth glass jar), select a container appropriate to the volume and container requirement given. Samples for more than one parameter can be collected into a single container if container and preservation requirements are the same (e.g., sulfate and turbidity).
- <sup>c</sup> Holding time for mercury is 28 days.
- <sup>f</sup> Nutrients include nitrogen, phosphorus, chemical oxygen demand.
- <sup>g</sup> TCLP Mercury maximum holding time is 28 days for extraction and 28 days for analysis.
- <sup>h</sup> For Radiological Testing, the specific analyses will be defined as some or all of the following: Gross Alpha, Gross Beta, Uranium 233+234, 235 and 238, Americium 241, Plutonium 239+240, Tritium, Strontium 90, 89, Cesium 137, Radium 226, 228.
- <sup>i</sup> Full suite, see footnote *h* above.

**NOTE:** The specified volumes and containers are recommendations and any changes should be approved through ASD. Multiple analytes should be combined in bottles if volume and preservative are comparable and follow the appropriate analytical method. Check with the ASD to confirm combinations allowed and volumes required by the laboratory.



**TABLE A-3**  
**SAMPLE CONTAINERS, SAMPLE PRESERVATION, AND SAMPLE HOLDING TIMES FOR**  
**GEOTECHNICAL SAMPLES**

**SOIL/GEOSYNTHETIC MATRIX**

Parameter	Sample Volume/Container	Preservative	Holding Time
<b>Geotechnical Parameters:</b>			
Atterberg Limits <sup>j</sup> , Grain Size Distribution (Particle Size) <sup>l</sup> , Moisture <sup>m</sup> , Specific Gravity, Visual Classification	One-gallon Zip-Loc Baggie <sup>k</sup> (500 grams per test if listed once)	None	28 days
Bulk Density (Proctor Test), Minimum (Maximum) Index Density	5-gallon Bucket <sup>n</sup>	None	6 mo.
<b>Compression:</b>			
Unconfined Compressive: One-dimensional Consolidated; Unconsolidated Undrained Compressive, Direct Shear <sup>p</sup> , Expansion Index	1-Shelby tube (3" diameter x 30" length) completely filled <sup>o</sup>	None	6 mo.
<b>Permeability:</b>			
Saturated Hydraulic Conductivity (Constant Head); Saturated Hydraulic Conductivity (Constant Flow, Rate); Capillary Moisture Relationships; Relative Hydraulic Conductivity for Air	1-Shelby tube (3" diameter x 30" length) completely filled <sup>o</sup>	None	6 mo.

<sup>j</sup> Atterberg Limits include Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

<sup>k</sup> The entire suite of analytical parameters can be performed on approximately 2-3 kilograms of material provided that the maximum grain diameter does not exceed 1-1/2 inches. Individually, the parameter test will require 500 grams of sample; therefore, use individual 500 gram samples if less than three of these parameters are requested for each sample.

<sup>l</sup> Grain Size Distribution includes Sieve Analysis of Fine and Course Aggregates and Particle Size Analysis.

<sup>m</sup> Moisture includes Laboratory Determination of Water (Moisture) Content of Soil and Rocks.

<sup>n</sup> Thirty pounds of material is required.

<sup>o</sup> Shelby tubes may be replaced with three California liners or three 2.5 inch U-type samples.

<sup>p</sup> Direct Shear includes Soils Under Consolidated Drained Conditions. For Geosynthetic material collect a 12 inch x 12 inch sample.

**NOTE:** The specified volumes and containers are recommendations and any changes should be approved through ASD. Multiple analytes should be combined in bottles if volume and preservative are comparable and follow the appropriate analytical method. Check with the ASD to confirm combinations allowed and volumes required by the laboratory.